Claims

1.   A method of determining the path of a signal
between a donor network element (14) and a remote station
(20), the donor network element (14) being associated with
5   at least one repeater (16, 18), comprising the steps of:
receiving at the remote station (20) a plurality of signals
associated with a plurality of network elements (10, 12,
14); calculating an estimate of the distance between the
remote station (20) and each network element (10, 12, 14),
10   including an estimate of the distance between the remote
station (20) and each repeater (16, 18) associated with the
donor network element (14); determining the one of said
estimates of the distance between the donor network element
(14) and at least one associated repeater (16, 18) and
15   remote station (20) which most closely approximates to the
distance between the other network elements (10, 12) and the
remote station (20); and selecting that donor network
element/repeater to be the source of the signal.

2.   A method according to claim 1, wherein the step of
20   calculating an estimate of the distance between the remote
station (20) and each network element (10, 12, 14)
comprises: selecting each one of the donor network elements
(14) and at least one repeater (16, 18) in turn as the
source of the signal; and performing said calculating step
25   for only the selected one of the donor network element (14)
and at least one repeater (16, 18).

3.   A method according to claim 1 or claim 2 wherein
the step of calculating the estimate of the distance
includes estimating the location of the remote station (20)
30   and thereby estimating an actual distance between each donor
network element/repeater and the remote station (20).

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4.   A method according to claim 3 wherein the step of calculating the estimate of the distance includes measuring physical quantities at the remote station (20), and thereby estimating a model distance between each network element/repeater and the remote station (20).

5.   A method according to claim 4 wherein the measured physical quantity includes the measurement, at the remote station (20), of one or all of: a time delay in a received signal; attenuation in a received signal or received signal strength.

6.   A method according to claim 5 wherein the step of estimating the actual distances further comprises summing the estimated actual distances.

7.   A method according to claim 6 wherein the step of estimating the model distances further comprises summing the model distances.

8.   A method according to claim 7 further including calculating a scale factor in dependence on the summed actual and model distances.

9.   A method according to claim 8 wherein the scale factor is determined to adapt the scaled sums to be equal.

10.   A method according to claim 9 wherein the scale factor is determined by dividing the summed actual estimates by the summed model estimates.

11.   A method according to claim 9 or claim 10 wherein the model distances estimates are modified in dependence on said scale factor to produce a set of modified model distances.

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12.   A method according to claim 11 wherein the model distances are scaled by the scaling factor to produce the modified model distances.

13.   A method according to claim 12 further including
5   calculating a difference value for each donor network element (14) and at least one repeater (16, 18) by summing the difference between each estimate and each modified model estimate obtained for each respective donor network element (14) and at least one repeater (16, 18).

10   14.   A method according to claim 13 wherein, the signal is determined to be transmitted from the donor network element (14) or at least one repeater (16, 18) having the lowest difference value.

15.   A method according to any one of claims 1 to 14
15   wherein a plurality of signals are from a donor network element (14), wherein all steps are repeated for each such signal to determine a source of each signal.

16.   A method according to any preceding claim, further comprising the step of calculating the location of the
20   remote station (20) in dependence on the determined source of the signal.

17.   A method according to any preceding claim wherein the remote station (20) is a mobile station and the donor network element (14) is a donor base station.

25   18.   A network device (20) adapted to determine the path of a signal between a donor network element (14) and a remote station (20), the donor network element (14) being associated with at least one repeater (16, 18), comprising means for calculating an estimate of the distance between

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the remote station (20) and each network element (10, 12, 14), including an estimate of the distance between the remote station (20) and each repeater (16, 18) associated with the donor network element (14), based on a plurality of

5   signals received at a mobile station (20); means for determining the one of said estimates of the distance between the donor network element (14) and at least one associated repeater (16, 18) and remote station (20) which most closely approximates to the distance between the other

10   network elements (10, 12) and the remote station (20); and means for selecting that donor network element/repeater to be the source of the signal.

19.   A network device (200) according to claim 18, wherein the remote station (20) is a mobile station and the

15   network element (10, 12, 14) is a base station.

20.   A network device (200) according to claim 18 or claim 19 wherein the means for calculating an estimate of the distance between the remote station (20) and each network element (10, 12, 14) includes: means for selecting

20   each one of the donor network elements (14) and at least one repeater (16, 18) in turn as the source of the signal; and means for performing said calculating step for only the selected one of the donor network element (14) and at least one repeater (16, 18).

25   21.   A network device (200) according to any one of claims 18 to 20 wherein the means for calculating the estimate of the distance includes means for estimating the location of the remote station (20) and thereby estimating an actual distance between each donor network

30   element/repeater and the remote station (20).

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22. A network device (200) according to claim 21 wherein the means for calculating the estimate of the distance includes means for measuring physical quantities at the remote station (20), and thereby estimating a model distance between each network element/repeater and the remote station (20).

23. A network device (200) according to claim 22 wherein the measured physical quantity includes the measurement, at the remote station (20), of one or all of: a time delay in a received signal; attenuation in a received signal or received signal strength. ·

24. A network device (200) according to claim 23 wherein the means for estimating the actual distances further comprises means for summing the estimated actual distances.

25. A network device (200) according to claim 24 wherein the means for estimating the model distances further comprise means for summing the model distances.

26. A network device (200) according to claim 25 further including means for calculating a scale factor in dependence on the summed actual and model distances.

27. A network device (200) according to claim 26 wherein the means for calculating the scale factor is adapted to convert the scaled sums to be equal.

28. A network element (200) according to claim 27 wherein the scale factor is determined by dividing the summed actual estimates by the summed model estimates.

29. A network device (200) according to claim 27 or claim 28 wherein the model distances estimates are modified

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in dependence on said scale factor to produce a set of modified model distances.

30. A network device (200) according to claim 29 wherein the model distances are scaled by the scaling factor
5 to produce the modified model distances.

31. A network device (200) according to claim 30 further including means for calculating a difference value for each donor network element (14) and at least one repeater (16, 18), including a summer for summing the
10 difference between each estimate and each modified model estimate obtained for each respective donor network element (14) and at least one repeater (16, 18).

32. A network device (200) according to claim 31 wherein the signal is determined to be transmitted from the
15 donor network element (14) or at least one repeater (16, 18) having the lowest difference value.

33. A network device (200) according to any one of claims 18 to 32 wherein a plurality of signals are received from a donor network element (14), wherein all steps are
20 repeated for each such signal to determine a source of each signal.

34. A network device (200) according to any one of claims 18 to 33, further comprising means for calculating the location of the remote station (20) in dependence on the
25 determined source of the signal.

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